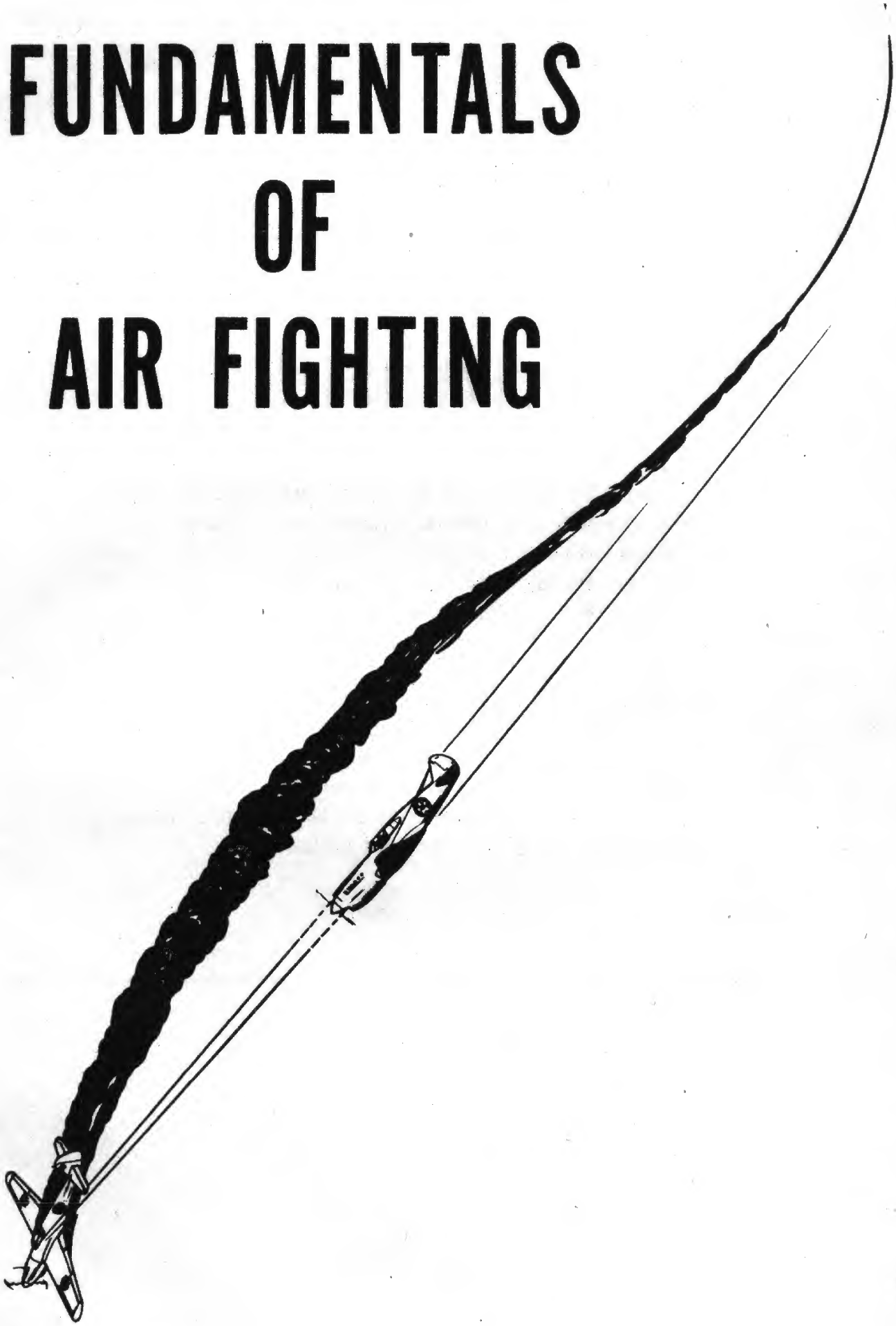
FUNDAMENTALS OF AIR FIGHTING



FOREWORD

The information contained in the following pages has been derived from official and accurate reports of actual air combats and operations. Much of what is repeated here is as old as air fighting itself. The information portrayed is disseminated not as inflexible rules or directives, but rather imparts something of what has been learned of air operations thus far and to encourage initiative and study of the subjects covered by all flying personnel. The air fighter must be constantly awake to all developments, be ever alert to use his best talents to meet the ever fast moving panorama of air warfare. To anticipate future developments one must have some knowledge of past and present methods.

I. GUNNERY PRINCIPLES

IN AIR COMBAT, the purpose of the fighter pilot, and flexible gunners, is to destroy the enemy quickly with the minimum amount of ammunition. This can best be accomplished by developing superior fire power, and firing at decisive range, which depend on:

Accuracy of gun sighting,
Number and type of guns and amount of ammunition available,
Correct estimation of range,
Concentration of fire power.

Concentration of fire power may be considered in two parts, viz:

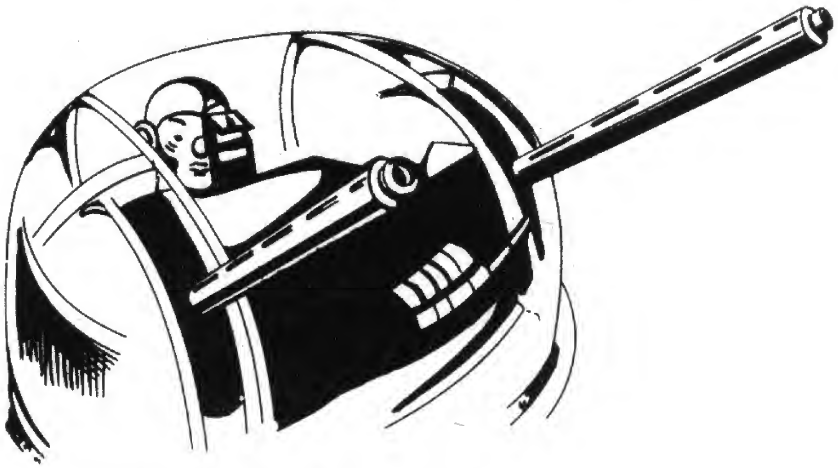
Concentration of fire in time and space depending upon the number of guns that can be brought to bear either from a single aircraft or from a formation;

Bullet density built up during fire, depending on time and range.

The area of space covered by the fire from a single gun is termed the "bullet group" for that gun.

The primary consideration is to obtain a bullet density which is likely to destroy the expected target.

The *total* "lethal area" of a target is the sum of the various small vulnerable or vital areas in the target in which it is probable that one bullet would result in disabling or destroying one target aircraft.



DESTROY THE ENEMY QUICKLY

Bullet density, and the size of the bullet group are directly proportional to range, i. e., the diameter of the group at 400 yards is four times that at 100 yards.

It is imperative, in air combat, that a lethal density be built up quickly because—

The opportunities for accurate shooting are short,

The quicker the lethal density is built up the less likely you are yourself to be shot down.

Increased lethal density can be built up by—

Higher rate of gun fire,
Increased number of guns,
Mutual support between guns of two or more aircraft,
Reduction of range,
Increased caliber of guns.

II. AIR FIGHTING PRINCIPLES

A FUNDAMENTAL of all air fighting tactics is *simplicity* and *flexibility*.

Tactics must be simple because of the *time factor*. The speed of modern aircraft does not admit of the development of elaborate formations and attacks. Other factors which demand simplicity are—

Difficulty of control,

Limited vision,

Difficulties of intercommunication,

Fleeting opportunity for decisive air combat,

Necessity of exploitation of varying weather conditions so as to effect surprise, viz; clouds, sun, haze, dawn, and dusk lighting effects.

Another fundamental affecting fighting tactics is MORALE and LEADERSHIP. A high morale is essential. It is dependent upon physical fitness, environment, a contented frame of mind and good leadership.

The leader must possess initiative and skill to judge when and from which direction maximum fire should be brought to bear. He must inspire confidence in air crews and know their ability and limitations. The good leader will aim to achieve a decisive success with the whole force under his command rather than to gain a personal victory.

Surprise is a most important factor in air fighting and a leader should maneuver for position to achieve surprise before attacking, if possible. Surprise may be achieved by—

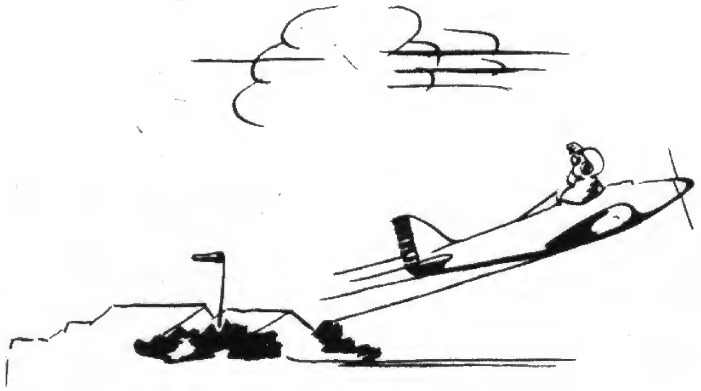
Attacking from directly out of sun,

Making use of the bank of haze. Aircraft approaching on the same level are difficult to see if they attack from the side remote from the sun. (A bomber, therefore, should try to fly well above the haze level so as to render a concealed approach by fighters less likely.)

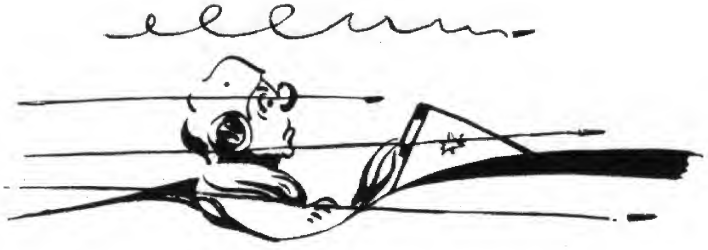
In the evening or early morning by attacking from that part of the sky which is darker,

By making good use of clouds or, in the case of fighters, by making an intelligent estimate of where enemy aircraft is likely to emerge.

When enemy aircraft is sighted in one direction, vigilance in other directions must not be relaxed. More often than not other supporting aircraft will be in the vicinity and to launch blithely into the attack on the first enemy seen without a quick search for other enemy planes is a sure way to be shot out of the sky and never know what hit you.



BEFORE TAKING OFF OR LANDING, SEARCH THE SKY



ABOUT TIME FOR EVASIVE ACTION

DON'T LET YOUR EAGERNESS SPOIL A COMBINED ATTACK AND INCIDENTALLY MAKE YOU A "SITTER"
FOR THE ENEMY

TEMPER DASH
WITH DISCRETION

III. SOME DO'S AND DON'TS

BEFORE taking off or landing, search the sky for enemy aircraft. It is at these moments your aircraft is most vulnerable.

If you hear gun fire, or see bullets hitting close to you or observe tracers going past *immediately* take evasive action—*then* look around. Don't try to look *before* starting to turn. It might be too late.

Develop a rubber neck. Keep the sky under constant surveillance.

Watch your tail.

Conserve ammunition.

Never fly or dive straight when being attacked by aircraft or anti-aircraft fire.

Fighters should endeavor not to close in on the enemy at too high a speed during the final stage of the approach or the burst of fire will be too short to be effective, or you may overshoot altogether.

Don't go into the middle of a V of enemy bombers. Attack them from the flank, and from both flanks simultaneously, where possible.

When you are going into the attack, don't give the enemy a chance at a deflection shot at you. As far as you can *keep your nose* on the enemy, and approach his blind spots as much as possible.

In attacking enemy bombers don't fire a long burst if enemy fighters are about; two seconds is long enough. Then break away quickly and look about to be sure no enemy fighter is after you. If all is clear you can take another crack at the bombers, if necessary.

Don't break away in a climbing turn. This gives an easy shot to the enemy rear gunner.

DEVELOP A RUBBER NECK

DON'T DISENGAGE IN A HAPHAZARD MANNER. REMEMBER THIS IS THE MOMENT WHEN YOU ARE MOST VULNERABLE TO FIRE FROM THE ENEMY'S REAR GUNS

DON'T GIVE THE REAR GUNNER A "SITTER"

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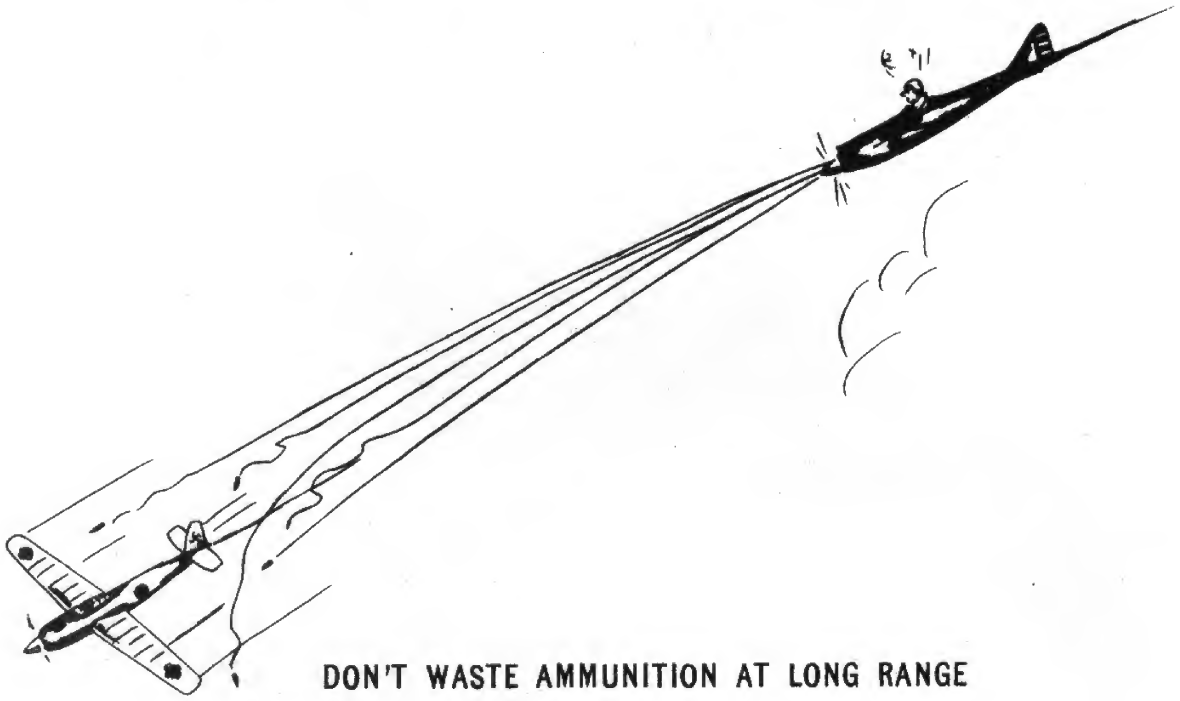
Don't leave your formation, if you can help it, unless ordered to do so.

Don't *ever* fly straight, especially if you are alone. Keep that rubber neck turning continuously and keep a lookout behind.

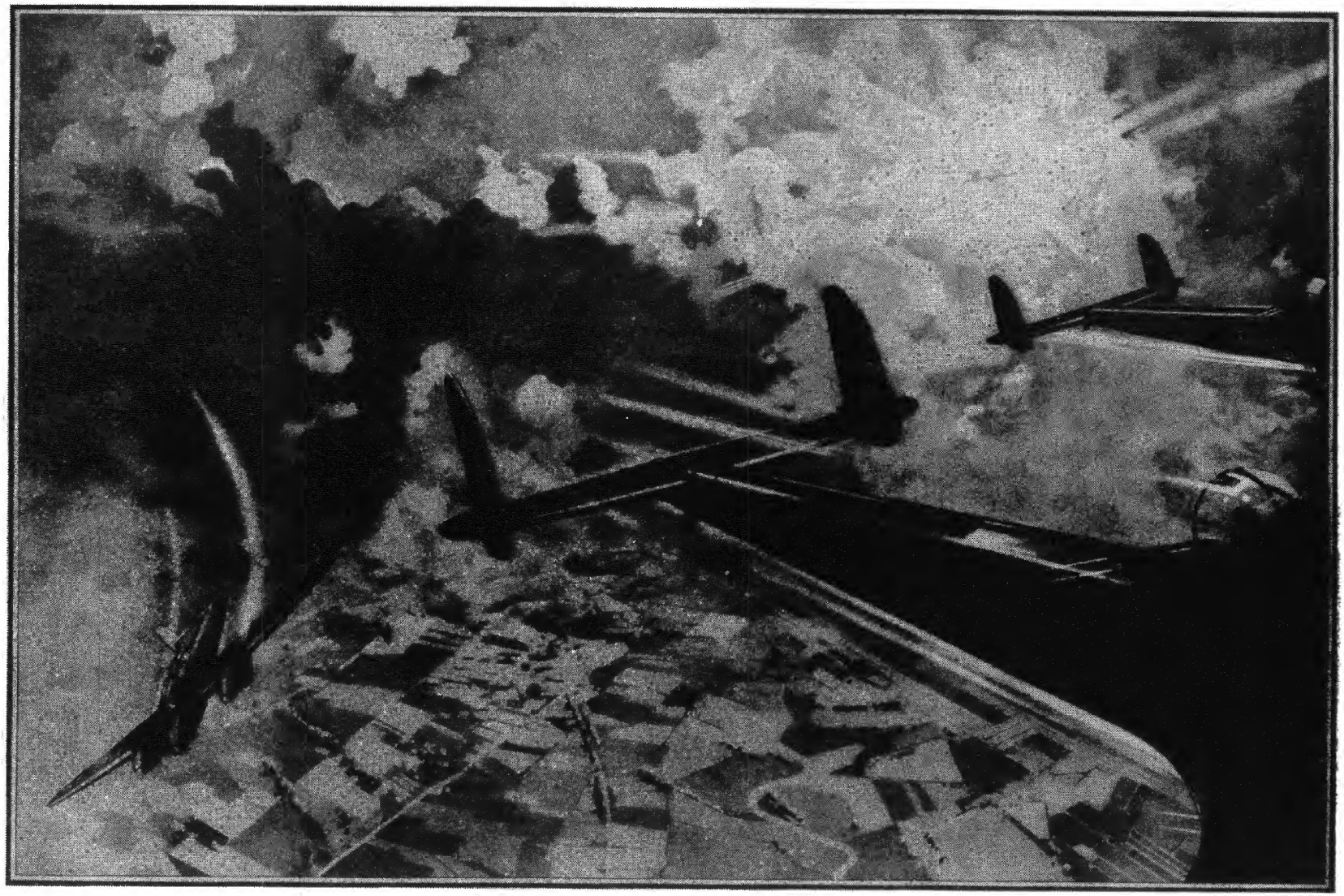
Don't let the enemy slip out of the sun to get you. In looking toward the sun place a finger or thumb before your eyes.

Don't waste ammunition by firing at long ranges.



DON'T WASTE AMMUNITION AT LONG RANGE

BEWARE OF THE HUN IN THE SUN



IN A SURPRISE ATTACK THE ENEMY MAY "COME OUT OF THE SUN" WHERE IT IS DIFFICULT TO SEE HIM. REMEMBER TO LOOK FOR THIS ESPECIALLY WHEN ABOUT TO ENGAGE ANOTHER AIRCRAFT THAT MAY PROVE TO BE A DECOY

IV. FORMATION PRINCIPLES

SIZE:

A large formation is more vulnerable to A. A. fire than a number of small formations.

The larger the formation the less maneuverable it becomes. However, it is more likely to subject attacking aircraft to a superior concentration of fire.

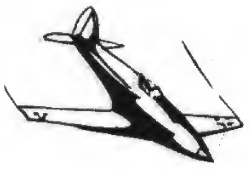
With a large formation there will be a tendency for a number of gunners to fire on a few enemy aircraft and to ignore others, and to waste ammunition. There is, therefore, a limit to the size of a formation to obtain economical fire concentration.

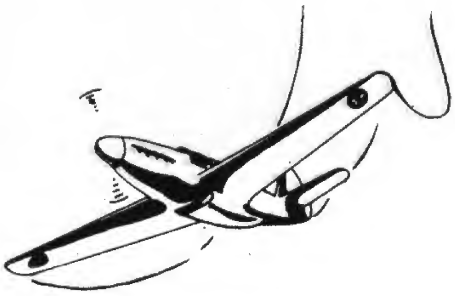
Aircraft which have blind sectors, or sectors of reduced fire power, need larger formations than those which have all round arcs of fire.

Small formations are less easily seen than large ones.

SHAPE:

Every pilot must be able *easily to see the* aircraft on which he is formating.





TURN TO THE ATTACK

IF YOU FALL OUT OF A FORMATION AND LAG BEHIND, YOU LOSE THE SUPPORT OF YOUR FELLOWS
AND ARE LIABLE TO FALL A PREY TO ENEMY CONCENTRATED ATTACK

THE STRAGGLER INVITES ATTACK

All aircraft in the formation must *keep station* on the leader, and as few as possible in *sequence*. Otherwise accumulated errors build up and the rearmost pilots have a very difficult task in maintaining proper position.

While being attacked, make it impossible to draw a straight line from the enemy aircraft line of approach through two or more aircraft of the formation. Otherwise the attackers may successfully *enfilade* the formation.

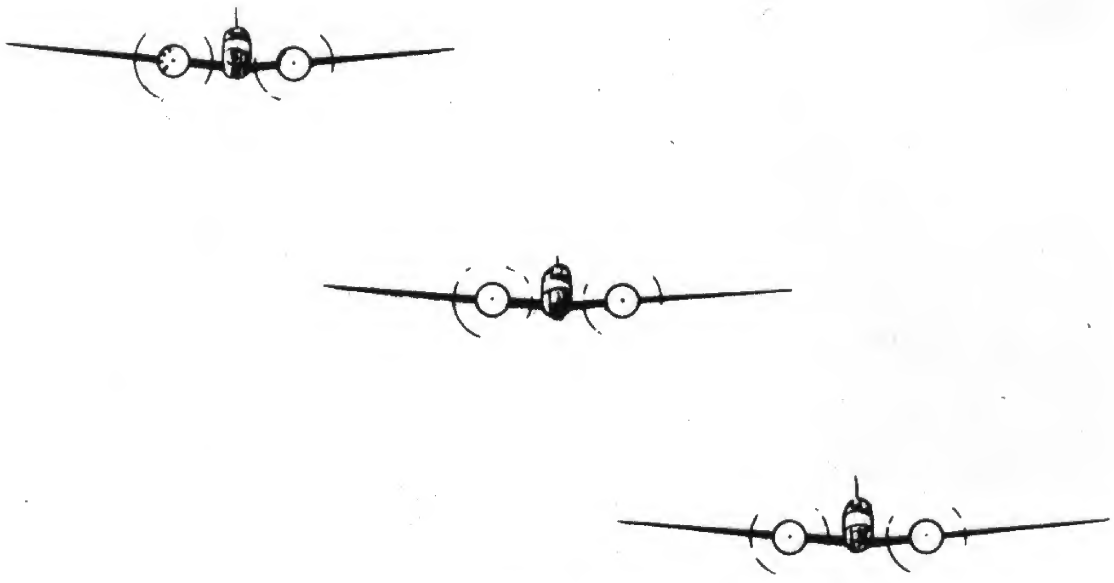
The length of the formation should be equal in all directions, where possible.

All aircraft in the formation, with possible exception of the leader to be equidistant from the enemy aircraft. Thus in defensive bomber formations every aircraft should be spread perpendicular to the enemy's line of approach.

Aircraft in formation should be *sufficiently far apart* to avoid one plane being hit by shots aimed at the other. At the same time they must be sufficiently close to provide maximum mutual support.

Formations disposed in depths create a large volume of slipstream turbulence which, when bombers are being attacked from rear, throws fighters off their line of sight.

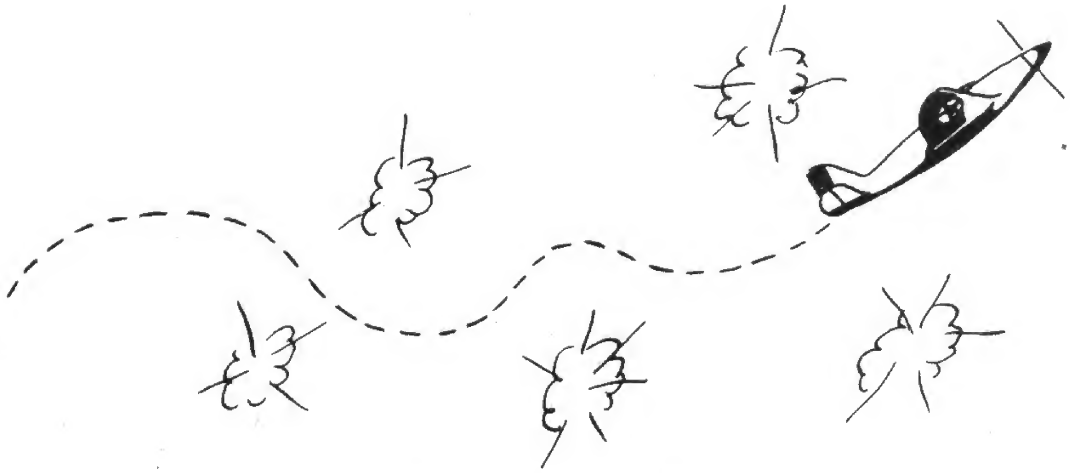
The *ideal* defensive formation will differ with every method and direction of attack. Each formation must, therefore, possess sufficient flexibility to allow a quick alteration to some other formation.



IF ATTACK IS FROM ABOVE, STEP FORMATION DOWN

The *disposition of aircraft* in formation will depend upon circumstances. For example, if attack on a defensive bomber formation is developing from above, aircraft in the formation should be stepped down—if the attack is from below the aircraft should be stepped up. If the attack is from the same level and developing from the beam aircraft should be stepped down (for it is *easier* for fighters to sweep a formation UPWARDS than DOWNWARDS. With aircraft on the nearer flank DOWN and on the outer flank UP.)

When encountering A. A. fire aircraft all sections should be far enough apart to avoid more than one aircraft being brought down by any one A. A. burst.



SPOIL THE A. A. AIM

IF ATTACK IS FROM BELOW
STEP FORMATION UP

V. EVASION PRINCIPLES

ALWAYS turn *toward* a fighter. Thus you shorten his approach, and therefore make him turn more rapidly. Maybe he won't be able, aerodynamically, to turn fast enough and he may be forced to break away. DO NOT turn *away* from the direction of attack.

A straight dive will give enemy aircraft a "sitting shot." You actually appear as a stationary target in such a dive either at a target plane or away from the plane.

Never change from one turn to a reverse turn. *Wait* for a brief interval between attacks. Take a quick look about before launching successive attacks.

When hedge hopping, or flying low over the sea, fly an erratic course.

Clouds, except the smallest ones, afford one of the best means of avoiding enemy aircraft. When possible fly near the clouds, but if over areas covered by A. A. fire *do not* fly immediately below the cloud base, as A. A. can accurately determine the range from the cloud base.

Do not fly *straight* through a cloud when avoiding enemy aircraft. Alter course in the cloud to turn *towards* the enemy.

Aircraft flying above 20,000 feet are difficult to see from the ground.

Avoid layers of air in which white streamers form astern.

At night *do not* open throttle because this increases length of exhaust flame which can be seen at long distances.

Show no lights on your aircraft.

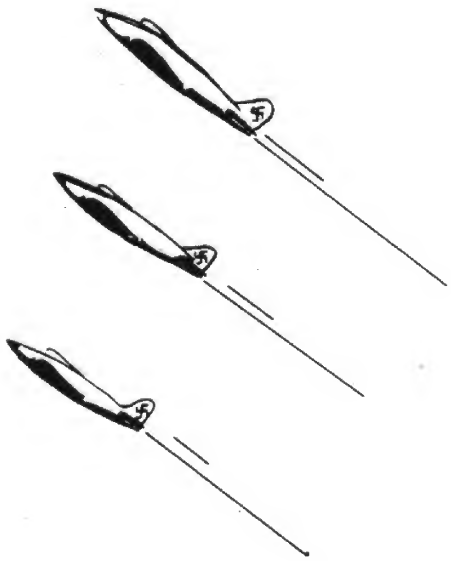
Searchlight beams without accompanying A. A. fire indicates presence of enemy fighters. Do everything possible to get out of the light.

To evade enemy fighters, fast bombers may be sent in advance of the striking force, to draw off enemy fighters. Also planes may be routed on dog-leg courses toward other important objectives with a view of deceiving the enemy as to the actual target.

EVADING SOUND LOCATORS

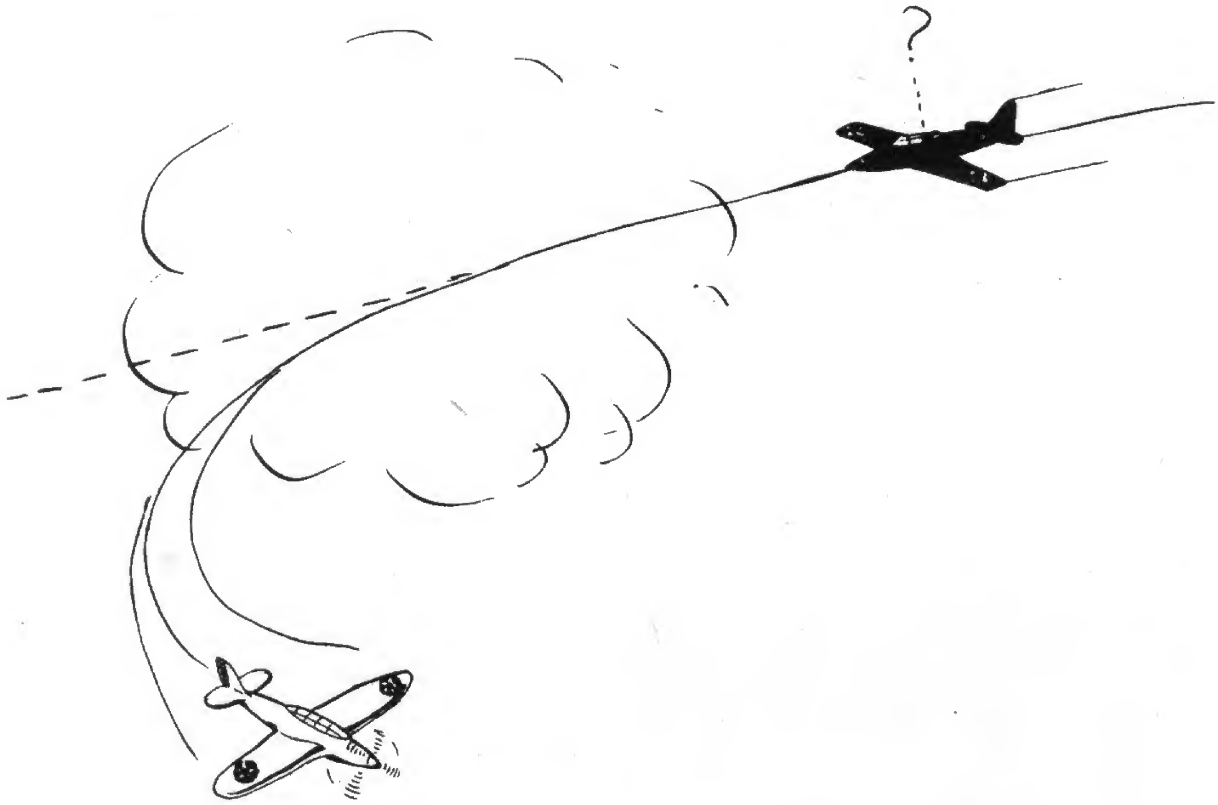
Searchlight and A. A. at night are directed by sound locators. (Radio aid is also said to be effective.) Sound locators may be avoided or deceived by one of the following means:

1. One aircraft to fly low, making a noise screen which will prevent aircraft flying high from being heard.
2. Gliding over the searchlight or A. A. belts in heights in excess of 6,000 feet where aircraft throttled back are inaudible.
3. Simultaneous raids on different or parallel courses at different heights will result in locators getting a false position.
4. Desynchronize engines. This is effective at least to inexperienced sound locator crews.
5. Most effective of all evasive measures are alterations in course, speed, and height.



Sound locator crews usually do not allow sufficiently for the lag in the time it takes the engine noise to reach them which results in searchlights and A. A. fire being below and behind. (Recently it seems German A. A. must be directed by radio-locators. Where radio-directed A. A. fire is encountered some of the foregoing suggestions, therefore will not apply.)

In seeking to avoid searchlights, *turn*. A climb or dive, *without turn* is ineffective.



TURN IN THE CLOUDS TO EVADE PURSUIT

CLOUDS CAN HELP

MAKE YOURSELF PERFECT IN INSTRUMENT FLYING AND KEEP IN PRACTICE. YOU CAN THEN WITHDRAW INTO CLOUD WHEN ATTACKED BY SUPERIOR ENEMY FORCES AND EVADE THEM IN SAFETY

VI. ANTI-AIRCRAFT EVASION

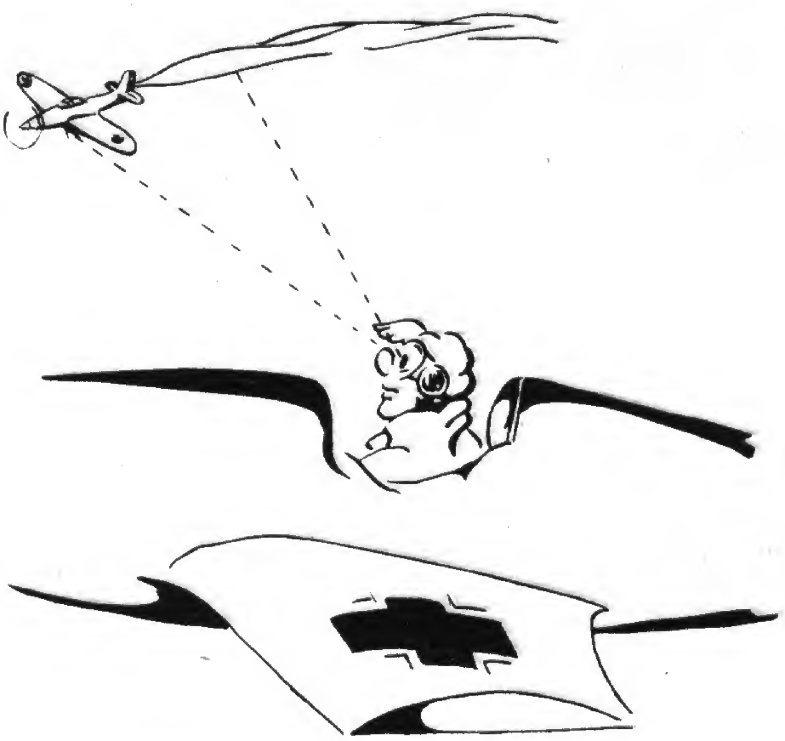
LONG RANGE A. A.

The A. A. gunner's greatest difficulty is finding the correct elevation. Consequently a change in height, as well as turning is the best method of evasion. Effective danger area of 3″ and 4.5″ shells is from 30 to 90 feet radius. The area behind and below the bursts is usually safe; therefore, it is best to fly below shell bursts rather than above them.

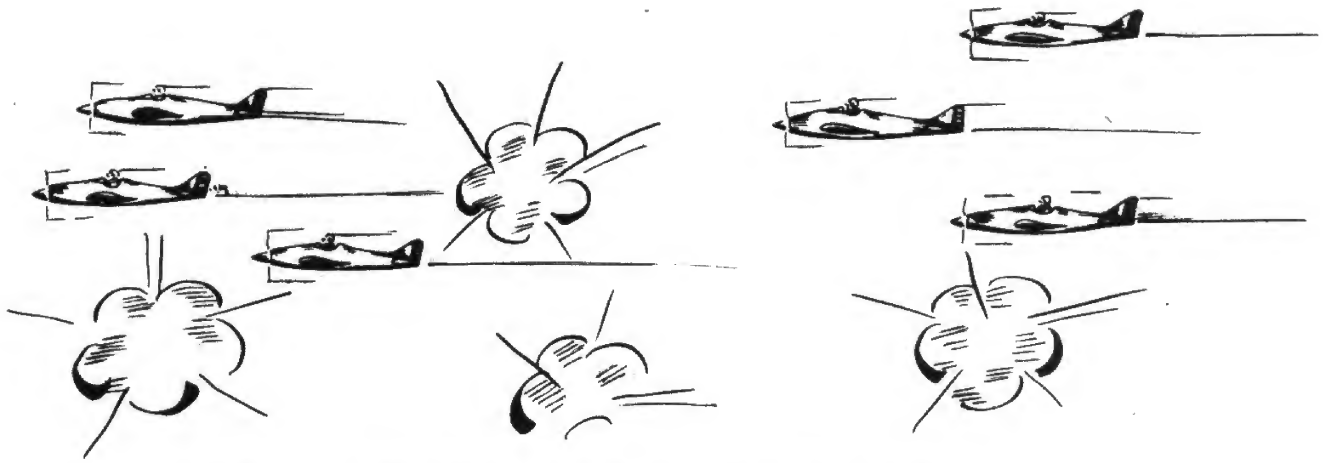
When within range of enemy A. A. it is imperative that course and altitude be altered continuously to avoid destructive hits.

Heavy A. A. fire is most accurate between 6,000 and 18,000 feet; therefore, if possible, fly above or below these heights.

The ideal target from A. A. point of view is a large formation in line astern. The most difficult formation for A. A. are small sections (of 2 or 3) flying line abreast, or shallow echelon, at different heights.



DON'T LEAVE TELL-TALE STREAMERS



DON'T LET ONE BURST GET MORE THAN ONE PLANE

At night it has often proved effective to drop a flare, or other object, and then dive or climb on a turn. The enemy A. A. often concentrate on the flare or other object, and thus enable you to get-away.

SHORT RANGE A. A.

Short range A. A. is usually ineffective at heights above 5,000 feet. Therefore fly at greater heights, or else very low.

Attacks against defended areas should be made suddenly and *not repeated* for at least 5 or 10 minutes. Make a low and quick get-away without trying to maneuver to observe effect of your attack.

Low flying attacks should be made from the direction of the sun, or from clouds and by taking advantage of topographical features.

If both short range and long range A. A. fire is expected the best compromise is probably to fly at about 5,000 feet, at ground level, or above 18,000 feet.

SOUND DETECTORS

PHYSICAL FITNESS

Physical condition cannot be over-emphasized. A tired, exhausted, or poorly conditioned flyer is cold meat for a well conditioned adversary. Top physical condition will not just come of itself. It must be cultivated. Proper exercise, adequate rest, between operational flights will pay the biggest dividends. Sound physical condition will contribute to a high morale, instill an eagerness to get on with arduous tasks, insure the successful operation of the unit.

NOTICE!

AIRMEN WHO KNOW EVERYTHING ABOUT FLYING

NEED NOT STUDY

THE FOLLOWING PAGES

Remember . . . ONCE is too Often!

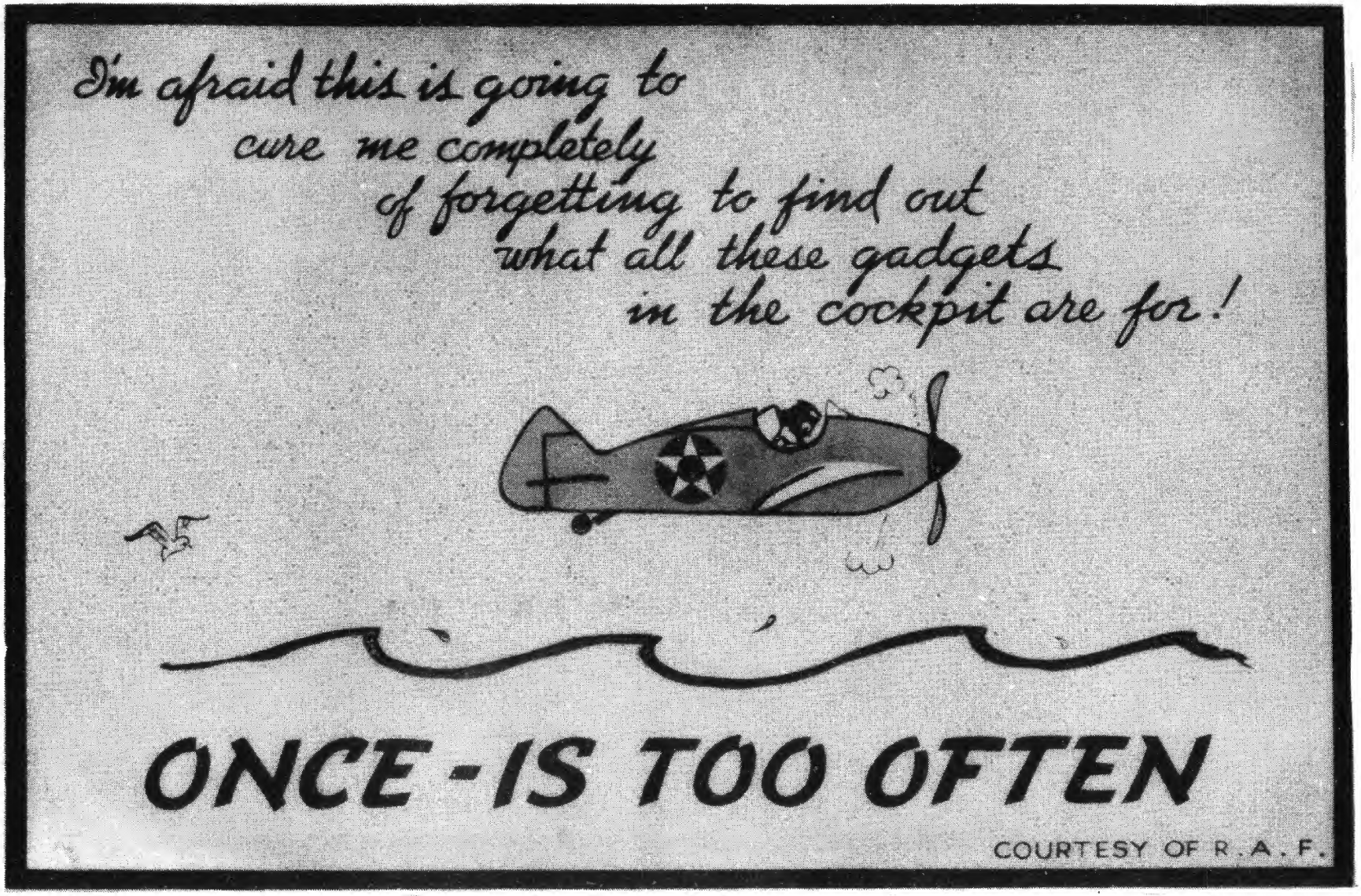

I'm afraid this is going to cure me completely of jamming my brakes on!
ONCE - IS TOO OFTEN
COURTESY OF R A F.


I'm afraid this is going to
cure me completely
of taking too
short a run
ONCE - IS TOO OFTEN
COURTESY OF R.A.F.


I'm afraid this is going to
cure me completely
of thinking I know better
than my compass!
ONCE - IS TOO OFTEN
COURTESY OF R. A. F.


I'm afraid this is going to
cure me completely
of taking off before
my engine's warmed up!
ONCE - IS TOO OFTEN
COURTESY OF R.A.F.


I'm afraid this is going to cure me completely of taking off with out looking round!
ONCE - IS TOO OFTEN
COURTESY OF R.A.F.


I'm afraid this is going to
cure me completely
of forgetting to find out
what all these gadgets
in the cockpit are for!
ONCE - IS TOO OFTEN
COURTESY OF R.A.F.

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